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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/568,614	08/23/2006	Atsushi Koizumi	286272US0PCT	9363

22850 7590 12/12/2007

OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, P.C.
1940 DUKE STREET
ALEXANDRIA, VA 22314

EXAMINER
KATAKAM, SUDHAKAR

ART UNIT	PAPER NUMBER
1621	

NOTIFICATION DATE	DELIVERY MODE
12/12/2007	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@oblon.com
oblonpat@oblon.com
jgardner@oblon.com

Office Action Summary	Application No.	Applicant(s)	
	10/568,614	KOIZUMI ET AL.	
	Examiner	Art Unit	
	Sudhakar Katakam	1621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 October 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-5* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Status of the Application

1. Receipt of Applicant's request for continued examination and remarks/arguments filed on 22nd Oct 2007 is acknowledged.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. The factual inquiries set forth in Graham v. John Deere Co., 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 1-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Okumura et al** (US 4,270,011) in view of **Smith** (US 5,204,064).

Okumura et al teaches a method in which, isobutylene in a C_4 hydrocarbon mixture, containing 40% of isobutylene, 40% of n-butene and 20% of butane, is selectively hydrated to tertiary butyl alcohol by carrying out the reaction with water at a temperature not above 100°C in the presence of an acidic cation exchange resin and a sulfone [col.2, lines 6-14]. The amount of solvent concentration of 50 to 97% by weight,

especially 60 to 95% by weight, and water/isobutylene molar ratio of from 1.0 to 10.0 preferably from 1.6 to 6.0, in a C4 hydrocarbon mixture containing isobutylene, n-butenes and butanes [col. 4, lines 16-22]. The starting C_4 hydrocarbon mixture containing isobutylene is reacted with the aqueous solution of the sulfone in a catalyst packed reaction vessel, and the resulting mixture of hydration reaction products is subjected to distillation [col. 4, lines 41-45]. The reaction rate and the conversion of isobutylene are remarkably increased, and tertiary butyl alcohol can be prepared in a high yield while occurrence of side reactions is inhibited [col. 4, lines 56-62].

Okumura et al also teaches that a strongly acidic cation exchange resin is preferably used as the porous, acid-type cation exchange resin and there may be used a sulfonated polystyrene-type resin formed by introducing sulfonic acid groups into a styrene-divinyl benzene copolymer base, a phenol-sulfonic acid type resin formed by introducing sulfonic acid groups into a phenol-formaldehyde condensate and a perfluorosulfonic acid type resin formed by introducing sulfonic acid groups into a vinyl ether fluoride-fluorocarbon copolymer.

The difference between the instant claims and **Okumura et al** is that in the instant claims the amount of isbutylene present in the mixture is 5-15% by mass, whereas in **Okumura et al** the mixture contains 40% of isobutylene. Another difference is that **Okumura et al** fails to teach swollen property of the cation-exchange resin with the solvent, and the use of catalytic distillation apparatus in the preparation of tertiary butyl alcohols.

The swelling property of the cation-exchange resin with the solvent is inherent property. Please note that the resins get swollen upon the addition of the solvents.

With regard to the catalytic distillation apparatus, **Smith** teaches a method and apparatus for conducting a catalytic distillation process for the production of tertiary butyl alcohol from hydration of isobutylene in presence of acid cation exchange resin [col. 4 and lines 27-34]. The reaction rate can be increased by improving the contact of the liquid with the catalyst, which is accomplished by increasing the liquid level in the reaction distillation zone [col. 2, lines 13-17].

The preparation of tertiary butyl alcohol from the mixture contains isobutylene and water in presence of a catalyst is known in the art. Please note that the reaction is specific to isobutylene in the mixture and it is independent of the content of the isobutylene in the mixture. Therefore, one would have been motivated to develop a more economical process to make tertiary butyl alcohol because **Okumura et al** teach a method in which isobutylene in a C_4 hydrocarbon mixture with n-butenes and butanes is selectively hydrated to tertiary butyl alcohol.

In view of explicit teachings of **Okumura et al** and **Smith**, the examiner asserts that it would have been obvious to a person of ordinary skill in the art, at the time of invention was made, to have modified the reference teachings, such as a mixture containing isobutylene, with combination of catalytic distillation apparatus in the production of tertiary butyl alcohol, with reasonable expectation of success. Please also note that isobutylene is selectively hydrated to tertiary butyl alcohol in **Okumura et al**.

Modifying such methodology is prima facie obvious because an ordinary artisan would be motivated to use known purified compounds or known apparatus to make the product more efficient or explore economical advantages over the other, since it is within the scope to optimize the conditions through routine experimentation.

Response to Arguments

5. Applicant's arguments filed on 22nd Oct 2007 have been fully considered but they are not persuasive.

The objective of the applicants' arguments is that the art upon which the office action has relied neither teaches nor suggests that useful methods of producing a tertiary butyl alcohol could be practiced using such low levels of isobutylene and/or the required swollen catalyst in a gas-liquid mixed phase reaction.

The examiner does not find these arguments persuasive. The examiner knew that the **Okumura et al** did not disclose the applicants' claimed low level percentage of isobutylene in the mixture for the preparation of tertiary alcohol. However, **Okumura et al** clearly suggest a method in which, isobutylene in a C_4 hydrocarbon mixture with n-butenes and butanes is selectively hydrated to tertiary butyl alcohol [col. 4, lines 16-22]. The preparation of tertiary butyl alcohol from a mixture containing isobutylene and water in presence of a catalyst is known in the art. Please note the reaction is specific to isobutylene in the mixture and it is independent of the content of isobutylene in the mixture. Therefore, one would have been motivated to do this because **Okumura et al** teach a method in which, isobutylene in a C_4 hydrocarbon mixture with n-butenes and butanes is selectively hydrated to tertiary butyl alcohol.

Examiner agreed that **Smith** reference neither teaches nor suggests using a C4 hydrocarbon mixture containing a low level of isobutylene. The purpose of the **Smith** reference is to compensate the deficiencies of **Okumura et al**, i.e., **Smith** teaches a method and apparatus for conducting a catalytic distillation process for the production of tertiary butyl alcohol from hydration of isobutylene in presence of acid cation exchange resin [col. 4 and lines 27-34]. Hence the combination of **Okumura et al** and **Smith** teachings read on the instant claims.

So, in view of the above explicit teachings of the references, the examiner finds that it would have been prima facie obvious to a person of ordinary skill in the art at the time the invention was made, to combine the teachings of **Okumura et al**, and **Smith** to arrive at applicants process, with reasonable expectation of success of making the tertiary butyl alcohol.

Conclusion

6. Claims 1-5 are rejected.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sudhakar Katakam whose telephone number is 571-272-9929. The examiner can normally be reached on M-F 8:30 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Yvonne Eyler can be reached on 571-272-0871. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

SK

ELVIS O. PRICE, PH.D.
PRIMARY EXAMINER